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ABSTRACT

Presented is a scheme for systematically analyzing curriculum prescriptions to produce probing arguments in defense of the instructional objectives of each curriculum. With the probing arguments thus defined, a defensible, analytical choice between the alternative prescriptions would be facilitated. Included are four detailed examples of the analysis process. (SL)

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ANALYZING CURRICULUM PRESCRIPTIONS:
A CASE STUDY IN THE CONTEXT OF SCIENCE EDUCATION

by

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A Thesis submitted in conformity with the requirements
for the Degree of Master of Arts in the
University of Toronto

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CHAPTER 1

FOCUS OF THE STUDY

Introduction

The aim of this study is to construct and explore the use of a scheme for probing arguments mounted in defense of instructional objectives. The use of the scheme in analyzing arguments takes the form of a case study using material drawn from the field of science education. However, the scheme itself is based on considerations that are in no way subject-specific. The study is thus potentially of interest both to science educators and to those concerned with more general issues in the curriculum field.

In the study, curriculum is considered as a practical enterprise, in the Aristotelian sense. This viewpoint provides the basis for a discussion of the nature of curricular prescriptions and of the ways in which they may be defended. The analytical scheme itself is developed using Frankena's model for analyzing a philosophy of education[1] and Gauthier's account of practical reasoning.[2] The scheme is applied to some of the arguments contained in a set of curriculum guidelines for science, currently in use in Ontario. On the basis of this trial use, limitations and potential for further use of the scheme are discussed.

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[1] William K. Frankena, "A Model for Analyzing a Philosophy of Education," in Readings in the Philosophy of Education: A Study of Curriculum, ed. Jane Martin (Boston: Allyn and Bacon, 1970), pp. 15-20.

[2] David Gauthier, Practical Reasoning (Oxford: Clarendon Press, 1963).

Background to the Study

In establishing the need for the scheme just described, the investigator considered the following points.

(1) Defensible curriculum action depends on deliberate choice among alternative curricular prescriptions.

(2) Curricular prescriptions, and therefore the arguments mounted in their defense, contain value positions as well as assumptions of a more factual nature.

(3) Deliberate choice among curricular prescriptions requires that values and assumptions underlying them be exposed for examination and discussion.

(4) No scheme is available for systematically analyzing curricular prescriptions and arguments for the purpose of revealing their values and assumptions.

These assertions are as applicable to choice and action in science education as they are in the context of any other subject area. Each of the assertions will now be examined in somewhat more detail.

Curriculum Characterized as a Practical Enterprise

Schwab's conception of the curriculum field in terms of the practical has implications for curriculum developers and researchers alike. One aspect of his work, pertinent to this study, is what he describes as an essential feature of curriculum, the "anticipatory generation of alternatives." He writes:

> Intimate knowledge of the existing state of affairs, early identification of problem situations, and effective formulation of problems are necessary to effective practical decision, but they are not sufficient. Effective decision also requires that there be available to practical deliberation the greatest possible number and fresh diversity of alternative solutions to problems.[1]

He continues by describing three reasons for such a feature. First, the solution to the problem is improved by the generation of new alternatives. Second, since the problem arises from a context, unique in time and place, the solutions that sufficed at an earlier time or in another place cannot be assumed to be adequate. Third, the nature of the problem itself is not always evident at the outset. Therefore, without the generation of an array of alternative courses of action, novel features of new problems may be completely missed or the problem itself may be dismissed as impractical. It should be noted, in passing, that Schwab's discussion is relevant to all types of curricular choices, including the selection of objectives. This study is limited to concerns about the defensibility of the choice among objectives as one part of the curriculum developer's overall task.

An illustration of the risks inherent in a failure to consider alternatives may be seen in the following example of a hypothetical school science curriculum committee, where Teacher X is considering what he will teach to Class Y in the following school year. His colleagues are urging him to use the set of objectives S, which they have themselves used (and, they add, successfully) for a number of years. They proceed to debate the merits and shortcomings of set S, without consideration for any of sets T, U, or V which also exist. Under such circumstances as these, one or more of the following may well occur.

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[1] Joseph J. Schwab, The Practical: A Language for Curriculum (Washington D.C.: National Education Association, 1970), p. 33. This (longer) version of Schwab's paper will be cited throughout this thesis.

(1) The possibility of an improvement in the course by the use of T, U, or V is eliminated.

(2) It happens that set S originated in an urban, American school system and Class Y is part of a school located in rural Ontario. Also, set S was developed in the early sixties and it is now 1976. It could be that making provision for the students to attain the objectives of set S will result in the meeting of non-existent needs, but the discussion of this issue does not arise.

(3) The possibility of outcomes other than those specified in set S having been eliminated from debate, the discussion takes a theoretical direction as the participants argue over the desirability or undesirability of these outcomes. Such a discussion has little potential for resolution and is likely to be concluded not by reasoned argument leading to consensus but by an uninformed majority vote or by veto by the senior person(s) present. It is this issue which lies at the heart of considering curriculum as a practical enterprise.

What must be sought is not an answer to the question, "Is S good?" but one to the problem of which of the alternatives S, T, U, or V is the best in the given situation. Furthermore, the conceptualization of the situation must take into account all the important attributes of it—the teacher, the students, the subject matter, and the milieu. The concern of this study is that teachers be assisted in making deliberate choices among the alternatives with regard to what they ought to teach. One of the ways in which deliberate choices can be assisted is if the basis for prescriptive curriculum statements is revealed. This study provides a framework for revealing the basis of such prescriptive statements.

The Basis for Curriculum Prescriptions

Peters has characterised education in terms of the notion of "initiation" of students into states of mind which are generally agreed to be worthwhile or desirable.[1] Thus educational discourse, especially where the curriculum is concerned—where one argues about what teachers ought to teach or what students ought to learn—is inevitably value laden.

Sometimes, this feature of curricular prescription is self-evident from an examination of the language used. If, for example, it is explicitly stated that it is considered desirable that students should be able to provide explanations for their observations of the physical world, then it is clear that a value position is being expressed. Furthermore, since the position is made clear, deliberation concerning several alternate value positions, some of which may be in conflict, is made possible. As a result of such deliberation a choice may be made as to the best course of action.

Frequently, however, it is not at all clear, from an examination of the language, firstly that a value position is being taken, and secondly, what the substance of such a value position is. Consider for example the following paragraph from the teacher's guide to Investigating the Earth, the textbook of the Earth Science Curriculum Project (ESCP).

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[1] Richard S. Peters, Education as Initiation (London: Evans, 1964), p. 15.

> An integrated, interdisciplinary science course that builds on the background of science acquired in the earlier grades and is closely related to the student's natural environment, the earth, is an important component of the K-12 science curriculum. Investigating the Earth is tailored to the above criteria.[1]

This paragraph appears to carry with it the implicit prescription that the teacher ought to use Investigating the Earth as a component of the K-12 science curriculum. In a similar way, stated or unstated conclusions or premises are to be found in many of the published sets of objectives which form part of curriculum projects.

The Contribution of Analysis of Arguments to Deliberate Choice

If a teacher is to make a deliberate choice among objectives, it is desirable that he be able to examine critically the basis of the arguments mounted in their defense. It is desirable that he first be aware of the necessary logical components of such an argument and second be able to analyze the argument so that these components are revealed. One of the problems of analyzing arguments of this type is that they are frequently couched in rhetoric that fails to make clear the underlying assumptions and values. It is only when such underlying assumptions are revealed, that they, rather than the argument as a whole, can become the object of deliberative discussion.

Since any curriculum prescription and thus the argument supporting it must entail one or more value positions, it is desirable that an analysis of the argument isolate and identify statements containing such value positions. In addition, there are other statements of a propositional nature which are usually, though not necessarily, present in curriculum arguments of this nature. These, unlike the value statements, are open to verification or at least to a discussion of their probable truth. Thus an adequate analytical scheme for use in laying bare the bases of prescriptive arguments will identify at least these two types of statement. Such a scheme will facilitate the determination of a defensible choice among objectives by the curriculum practitioner.

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[1] Investigating the Earth, Teacher's Guide, Earth Science Curriculum Project (Boston: Houghton Mifflin, 1967), p. 1.

The Availability of Appropriate Analytical Schemes

There are a number of ways in which objectives themselves can be analyzed. Bloom's taxonomy of educational objectives provides one method,[1] based on the types of cognitive outcome specified by the objective. The perspective for such a scheme is psychological; other perspectives provide other bases for alternative ways to examine and analyze the objectives or the intended outcomes of an educational program. Among the more comprehensive attempts at curriculum analysis is the Curriculum Materials Analysis System (CMAS), developed in West Germany, as a means for the description and comparison of curriculum projects in science.[2] Components of the analysis include content, instructional methods, adaptiveness, effectiveness and administration;

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[1] B. S. Bloom, Taxonomy of Educational Objectives, Handbook 1, Cognitive Domain (New York: McKay, 1956).

[2] Peter Häussler and June Pittman, A Curriculum Material Analysis System for Science, (Weinheim, West Germany: Beltz Verlag, 1973).

its comprehensive nature provides the most useful means available for a descriptive comparison of published curriculum materials. It does not, however, address the issues that this study argues are central to the determining defensible choice, namely those which concern the values implicit in both the objectives and the arguments made in their defense.

Finally, a search of the literature for the years 1966 - 1975 was carried out, using the ERIC data-base, and no references could be found where schemes incorporating all the attributes of defensible curriculum action are described.[1] Such a finding is consistent with the claim made by Macdonald and Clark that processes of this sort have "never been clearly explicated or researched."[2] They offer no direct evidence to support this but repeatedly comment on the inadequacy of current research to assist the resolution of these problems.

Summary

The study, then, consists of two main parts. In chapters 2 and 3, discussion of significant features of curriculum choice and of prescriptive arguments provides the foundation for the construction of the analytical scheme. This discussion and, consequently, the scheme itself are not tied to any specific subject field; they apply with equal force to science or language arts, mathematics or social studies.

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[1] Major descriptors used were 'curriculum' and 'objectives' and either 'analytical criticism' or 'comparative analysis.'

[2] James B. Macdonald and Dwight Clark, "Critical Value Questions and the Analysis of Objectives and Curricula," in Second Handbook of Research on Teaching, ed. Robert M. W. Travers (Chicago: Rand McNally, 1973), p. 408.

Chapter 4, however, contains a demonstration of the use of the scheme, which does require some specific curriculum prescriptions to serve as the objects of analysis. Furthermore, ability to use the scheme requires that the analyst have an adequate background in the subject area involved. He must be able to identify issues which relate in a direct way to the subject matter of the prescription. The background of this investigator is in science and science education; it is therefore appropriate that the material used for analysis purposes in this study is drawn from science curriculum guidelines.

CHAPTER 2

THEORETICAL BACKGROUND: DISCUSSION OF TERMS

Introduction

The introductory chapter made reference to a number of terms of key importance to the study. These warrant further discussion before development of the proposed analytical scheme is described. The terms discussed in this section are objectives, teacher (as decision-maker), choice, and arguments in support of objectives. A consistent understanding of the ways in which these terms are used in the present document will provide an essential foundation on which the development of the scheme may be built.

Objectives

Use of the Term

The term "objectives," as it is applied to the intended outcomes of a curriculum, has been in educators' language for over sixty years.[1] Its increased use in the last two decades is, in part, a consequence of the behavioral objectives movement and the recognition by evaluators of the importance of specific and observable outcomes. Popham, himself an evaluator, writes:

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[1] For example, Franklin Bobbitt, The Curriculum (Boston: Houghton Mifflin, 1918) uses the term and it had been used even earlier than that. Encyclopedia of Educational Research, 4th ed. (1969), s.v. "Objectives and Outcomes," by Margaret Ammons.

> A key feature of any rational planning, educational or otherwise, is the possession of some idea of what is to be accomplished. Educators, of course, characteristically describe these intended accomplishments as their goals or objectives. Some people use the terms "goal" or "objective" interchangeably, as well as such synonyms as "aims," "intents," etc. Other people employ a much more distinctive meaning of the terms, using "goal" to describe a broader description of intent and "objective" to denote a more specific spelling out of the goal.[1]

As he goes on to point out, there is no clearly preferred usage for these terms. In the present document, therefore, the term "objectives" will be used to describe a variety of intended outcomes, whether broad or narrow, general or specific, behavioral or non-behavioral, vague or clear. This is not to deny, by default, the potential usefulness of a distinction to be made between "aims" and "objectives," such as the one Peters makes when he describes "aims" as "principles of procedure" and "objectives" as "states to be arrived at."[2]

Hence, Popham's point is valid (as is Peters'): distinctions are sometimes deliberately signalled by the use of various terms not intended to be synonyms of "objective." Later in this document the term "dispositions" will be encountered. Frankena uses it in the development of his model for analyzing philosophies of education to characterize all states of mind that are intended to result from the educational process.[1] The term, even in the broad sense in which Frankena uses it, suggests a distinction from the term "objectives" especially as the latter term is used by the proponents of behavioral objectives. For the purposes of this study, no such distinction is intended and the terms "objectives" and "dispositions" will be used interchangeably.

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[1] W. James Popham, An Evaluation Guidebook (Los Angeles: International Objectives Exchange, 1972), p. 11.

[2] Richard S. Peters, "Must an Educator have an Aim?" in Authority Responsibility and Education (London: George Allen and Unwin, 1959), p. 90.

The Function of Objectives

Statements of objectives are, firstly, communications intended for teachers. They may, of course, be passed on and used by others—the students, school administrators, parents, for example—but it can be reasonably assumed that the prime recipients will be teachers responsible for the courses of which the objectives form a part. Furthermore, it is expected that the teachers' conduct will be affected by them in some significant way. If the course is to provide students with the means for attaining certain objectives, then it seems reasonable to suppose that the activities of the teacher will be related in a direct way to the objectives. At least, that is likely the intention of the developers of the objectives. Thus, although objectives are not explicit instructions to the teacher on what he *ought* to do, they carry implications for those activities and indirectly, therefore, they constitute *advice* to the teacher relative to what he should do. Accordingly a set of objectives may be described as *practical advice*. In a later section methods of appraising such advice will be discussed.

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[1] Frankena, "A Model for Analyzing a Philosophy of Education," p. 16.

The Teacher as Decision-maker

Throughout this study, the teacher is referred to as the one responsible for choosing among sets of objectives. In a particular situation it may be that a curriculum committee, a school administrator, or some person other than the teacher is responsible for such a choice. It is not within the scope of this study to discuss the significance of the question as to who does or should make curriculum decisions, although it is recognized that this is indeed an important issue. What is involved here is a discussion of the logical basis for such decisions. The use of the term "teacher" is not therefore a stipulation of what the role of the teacher is or should be, nor does it presume an answer to the question of who should make curriculum decisions.

It is recognized, however, that in practice—in the classroom itself—it is indeed the teacher who is responsible for the execution of the curriculum; in this capacity the objectives of the curriculum are under his or her control. It is quite possible that the original objectives of the curriculum as planned and agreed to in advance may undergo modulation or amendment at this stage. The power of choice at this stage therefore clearly rests with the teacher as he exercises his autonomy within the classroom. What is of importance, then, is that the teacher realize what is involved in this exercise of his choice and that he be able to exercise it to defensible ends.

Choice

Choices may be regarded as being of at least three broad types. Here they are designated as intuitive, quasi-intuitive and deliberate. The basis for this distinction rests on the logical and psychological dimensions of the manner in which the choices are made, not on the substantive issues at stake in the choice situation. In principle, then, most choices can be made intuitively, quasi-intuitively or deliberately, though in practice it may be that some choices tend to be made more frequently in one manner than in either of the other two. One of the concerns of this study is that choices among objectives be made deliberately; it is therefore toward this end that an outline of each mode of choice is set out here.

Intuitive Choice

Intuitive choices are those which are made in an instant and without careful reasoning. They include, for example, the many on-the-spot choices made in the course of conversation with respect to the use of words, of hand-gestures or, in a classroom, of a chalk board. It must be emphasized again that it is not the substantive elements in the choice situation that would cause it to be classified as intuitive. The use of words may be the result of careful reasoning as in the case of a speech at a formal occasion, and the use of a chalk board in a classroom may be the result of a carefully planned lesson. The evidence for the classification of a choice as intuitive is found not in the outcome of the choice but in the manner in which the choice was made.

In a curriculum context, there can be little doubt that many choices, particularly those in the classroom, are made intuitively. Most of the choices with respect to objectives, however, probably do not fall into this category. In general, choices concerning objectives are made in advance of the instructional situation and are thus made under relatively less pressure than is found within the classroom.

Furthermore, such choices are usually regarded as being of sufficient significance that those who make them do so in a deliberate and careful fashion. It was pointed out earlier, however, that modulation of instructional intents does go on in the classroom during the instructional process. Thus it is conceivable that choice of objectives can be an intuitive choice. If this occurs, then an argument in defense of the outcome (of the choice) can only be made ex post facto. The analytical scheme developed in this study is designed to be applicable to all such arguments; in practice, however, since those relating to intuitive choices are rarely documented, the arguments are seldom open to any scrutiny.

Quasi-intuitive Choice

This category of choices is designated quasi-intuitive because, from the perspective of a third party, a choice has been made which has all the characteristics of an intuitive choice, but the chooser does not regard himself as having made a choice at all. An example, albeit a trivial one, of such a quasi-intuitive choice might be as follows. A car driver misses a turning in the road which he should take to reach his destination. An observer, standing beside the road, notices that the driver failed to make the turning. Now the driver, having failed to see the turning, might assert that he had no choice. The observer, being aware of the turning, could respond by pointing out that since the turning existed, the driver did indeed have a choice, but apparently chose intuitively to continue on his previous course. Such a situation would be classified as a quasi-intuitive choice situation.

There are several ways in which quasi-intuitive choices may be made in curriculum. Therefore it is important that, if the teacher's goal is to make deliberate choices, he be alerted to those occasions on which he can be shown to have made quasi-intuitive choices. The issue of defending a quasi-intuitive choice does not arise, because alternatives are not seen to exist. Once the existence of alternatives has been demonstrated and the nature of the choice exposed, then reconsideration of the issues can take place. This becomes a deliberate choice, however. One of the functions of the analytical scheme developed in this study is to facilitate the exposure of arguments or statements which invite the reader to make quasi-intuitive choices. By fulfilling this function, the scheme can assist the teacher to make deliberate choices.

Deliberate Choice

The third category of choice is that in which the choices are made as the result of rational and deliberate judgement. The chooser recognizes that (a) a choice situation exists, and (b) the manner of its making is deliberate rather than intuitive, i.e., it involves reasoning rather than impulse. The type of reasoning involved in deliberate curriculum choices is the subject of the next section of the study.

Arguments in Support of Objectives

It has been argued that one of the teacher's functions is the deliberate choice of objectives from among alternatives. This activity must assume that an array of alternative objectives already exists. It has been further argued that any set of objectives, together with its supporting argument, constitutes a piece of practical advice for the teacher concerning what he should teach. The deliberation that results in a decision consists of weighing the various pieces of advice and eventually either acting on one or choosing to delay the decision and to seek further advice. Gauthier, writing about practical advice, states: "Good advice rests on valid practical arguments."[1] It is therefore illuminating to examine more closely the characteristics of practical reasoning in order to determine the structure of arguments mounted in defense of objectives.

Practical Reasoning[2]

At the outset, Gauthier sets bounds to the field by pointing out that:

> General formulae for the solution of practical problems, or for the justification of proposed solutions, which do not take account of the dynamic context, can offer little practical guidance to the agent....In practice the answer to a practical question must depend, not only on an appeal to a hierarchy of principles, but far more on an appeal to a context of activity, in which the general programme of action is already fixed. Practical reasoning often consists in showing that an action fits into such a context.[3]

He goes on to describe the nature and structure of a piece of practical reasoning. In a practical syllogism, the major premise is one that

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[1] Gauthier, Practical Reasoning, p. 66.

[2] Gauthier makes the nice distinction between deliberation, "the *psychological* process by which a person comes to resolve a practical problem," and practical reasoning, "the *logical* argument in which the steps leading to the resolution are formally set out" (Ibid., p. 26). In this section of the study, it is practical reasoning that is the focus of attention.

[3] Ibid., p. 3.

"characterizes the state of affairs wanted as in some way desirable, worth wanting."[1] Such a premise he describes as having "practical force," and he adds that "*at least one premiss* [sic] *with practical force is required in any piece of practical reasoning.*"[2]

The major premise is thus a statement which embodies the values of its author; it characterizes what he considers to be worthwhile or desirable. In a curriculum context, such a statement would indicate those "states of mind" considered to be desirable outcomes of an educational program. Statements of this type underlie all arguments supporting instructional objectives. One function of the scheme developed in this study is to facilitate the identification of value positions inherent in curriculum prescriptions.

In addition to the value premises which must be present in a practical argument, there are usually other premises—statements concerning the situation or the "context of activity," the capacity of the agent to act, and the possible or probable consequences of his acting in a given way. These additional or situational premises serve to relate the major premise of the argument to its conclusion. They are statements of fact setting limits to the range of options open to the agent. In the case of practical arguments which are curriculum prescriptions, these situational premises specify relevant attributes of the context in which the action is to take place. These attributes have been described in terms of the four commonplaces: the teacher, the learners, the subject matter, and the milieu.[3] The situational premises in curriculum prescriptions are thus typically concerned with these commonplaces. A second function of the scheme is to identify statements of this type in such a way that further scrutiny of them is facilitated. Error in matters of fact, where situational premises are concerned, can then be more readily detected.

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[1] Ibid., p. 30.

[2] Ibid., p. 31.

[3] For example, Ralph W. Tyler, *Basic Principles of Curriculum and Instruction* (Chicago: University of Chicago Press, 1949), chapter 1.

Finally in the practical syllogism there is the conclusion which is a statement of what ought to be done. A curriculum prescription is a statement of what a teacher ought to do—of what his objectives ought to be. The complete argument may thus be shown in its simplest form as in the following schema of Gauthier:

> Doing x would be desirable (or, would bring about a desirable situation); I can do x, so I ought to do it.[1]

It was stated earlier that the deliberative process involves the weighing of alternative sets of objectives each with its own supporting argument. Thus, several arguments may be expected, each of the general form described above but involving activities y, z, and so on. Furthermore, since curriculum prescriptions constitute advice to the teacher concerning what he ought to do, the function of the deliberation is a comparative appraisal of these pieces of advice.

Appraisal of Advice

In a section entitled "Appraisal of Advice," Gauthier discusses the types of criticism to which both advisors and advice may be subject. Advisors may be criticized for their competence, their sincerity, and their entitlement to advise. This may be a significant issue in some curriculum deliberation, but it is beyond the scope of this study to examine it further. On what may go wrong with the advice itself, Gauthier writes:

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[1] Gauthier, Practical Reasoning, p. 44.

> ...since advice is based on practical judgement, what may go wrong with it is what may go wrong in establishing a practical judgement. Three different failings may be distinguished: mistake with respect to the practical basis, or the corresponding premisses with practical force; mistake with respect to the situation, or the other premisses about the situation; erroneous reasoning from premisses to conclusion.[1]

In order to facilitate the comparative appraisal of different pieces of advice, the function of an analytical scheme **would be to identify** (a) the conclusions of the arguments, (b) the premises with practical force, and (c) the situational premises. The task of the deliberation then involves taking these products of analysis and appraising them in the manner implied by Gauthier's statement cited above. The premises with practical force, containing the value positions, would be compared to the values of the teacher, the school, and the community—"the context of activity in which the general programme of action is already fixed." The situational premises—the matters of fact—would be examined to determine whether they are indeed matters of fact rather than value, and if found to be factual, what support exists for them. Finally, the reasoning from premises to conclusions would be open to examination.

The analytical scheme that is developed in this study, therefore, enables the user to lay bare the bases of curricular prescriptions. As a result of such exposure, it is intended that deliberation leading to a defensible choice be facilitated.

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[1] Ibid., p. 72.

CHAPTER 3

DEVELOPMENT OF THE ANALYTICAL SCHEME

In the preceding chapter, analysis of practical advice revealed that two essential elements must be identified by an analytical scheme used to examine arguments mounted in defense of objectives. In this section, a model will be described which accomplishes this; on the basis of the model, a scheme for analyzing such arguments will be proposed, and procedures for its use will be outlined.

The Frankena Model[1]

Background

The model described here was developed by William K. Frankena as a means to describe, understand, and criticize what he calls "normative philosophies of education." The writings of philosophers such as Aristotle, Dewey, or Whitehead, unlike those of the more recent school of analytical philosophers, consist of statements of what their authors consider ought to be the aims, methods, and activities of the enterprise of education. Frankena's analysis of such philosophical statements starts from the principle that education is, itself, a normative activity—that it involves a process which "issues or is intended to issue in the formation, in the one being educated, of certain desired or desirable abilities, habits, dispositions, skills, character traits, beliefs, or bodies of knowledge..."[1] Peters goes further. He writes: "[Education] implies that something worthwhile is being or has been transmitted in a morally acceptable manner."[2] Such a notion as this includes both the means and the ends of education under the same general rubric of "normative". It is with the objectives and therefore the outcomes of education, however, that this study is concerned. It should be noted that Frankena is using the term "dispositions" to refer to all types of outcome.

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[1] Frankena, "A Model for Analyzing a Philosophy of Education."

Instructional objectives have already been characterized as statements about the intended outcomes of a curriculum. Arguments intended to provide rationales for them are comparable therefore to normative philosophies of education, and it is thus a justifiable move to use a model, designed to explore the latter, as the basis of a scheme for analyzing the former. Frankena's model will therefore next be outlined, together with the adaptations necessary for the analysis of **prescriptive arguments.**

Description of the Model

Frankena starts from the premise that the first task of a complete normative philosophy of education is "to list and define a set of dispositions to be fostered."[3] The result of this will be a set of normative statements. The philosophy will also do two further things. It will show that such dispositions are desirable by introducing some "basic premises about the aims or values in life—about what is desirable or obligatory."[1] It will also show, or give reasons for thinking, that persons must acquire the first-mentioned dispositions in order to live in the way implied by the fundamental values described. In summary, Frankena writes:

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[1] Ibid., p. 16.

[2] Richard S. Peters, Ethics and Education (Glenview, Ill.: Scott Foresman, 1967), p. 3.

[3] Frankena, p. 17.

> What is logically required is, first, some normative premises stating basic goals or principles: for example, Aristotle's premise that the good life is a happy one consisting of intrinsically excellent activities like contemplation, and second, factual claims stating that certain dispositions are conducive to the achievement of those goals or to the following of those principles: for example Aristotle's further claim that, if we are to achieve the good life as he sees it, we must cultivate such dispositions as moderation, practical wisdom, and a knowledge of mathematics, physics, and philosophy.[2]

He represents his model diagrammatically as a system of boxes, shown here in Figure 1.

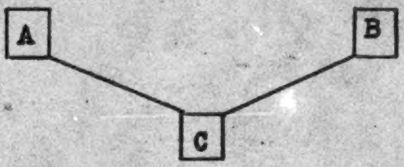

Figure 1

In the diagram, A represents the "basic normative premises," B, the other (empirical, epistemological, ontological etc.) premises, and C, the conclusions—the dispositions to be fostered.

Frankena continues by discussing what a complete normative philosophy of education would say concerning the means by which such desirable dispositions may, in practice, be fostered. However, it is adequate for the purposes of this study to concentrate on the first part of the model, as outlined above, since it is with objectives that this study is concerned.

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[1] Ibid.

[2] Ibid.

It would appear that Gauthier's "premisses with practical force" are conceptually parallel to Frankena's "basic normative premises" (Box A); that Gauthier's situational premises correspond to Frankena's Box B; and that the mistakes which, Gauthier points out, can take place in establishing a practical judgement are precisely those which may occur in arriving at the conclusions Frankena labels as Box C. The model therefore seems to be entirely congruent with the specifications for an analytical scheme that have been established.

Analyzing Prescriptive Arguments: Primary Level

General Comments

A set of objectives (or just one objective) may be regarded as the conclusion of an argument (Box C) in which the premises are of two types. The first (Box A) consists of the basic normative premise(s)—those having practical force—which characterize desirable dispositions the curriculum is intended to foster. The second (Box B) includes the supporting propositional statements, both made explicitly or implied by the sense of the language used. Such propositional statements may include empirical, epistemological, ontological and other statements, and will be the object of the second level of analysis to be discussed later. All statements that fall within the scope of the scheme will, henceforth, be referred to as type A, B, or C statements respectively.

Thus the initial questions that emerge for the primary level of analysis are:

(1) WHAT OBJECTIVE IS SPECIFIED OR IMPLIED?—type C statement

(2) WHAT BASIC NORMATIVE PREMISE(S) IS/ARE STATED OR IMPLIED?—
type A statement(s)

(3) WHAT PROPOSITIONAL STATEMENT(S) IS/ARE MADE OR IMPLIED?—
type B statement(s)

A Sample Analysis

A brief illustration of the analysis procedure will serve to amplify the foregoing general comments and will provide a vehicle for demonstrating the resolution of anticipated problems.

The problem of alternative interpretations

The Ontario Intermediate Science Guidelines contain the following statement:

> [The students should be] given every opportunity to learn through personal handling of laboratory equipment and performance of experiments so that they may...gain a respect for technical competence.[1]

This statement provides an illustration of a passage which is open to more than one interpretation. Two alternatives will be described here and the reason for selecting one of these will be explained. The statement can be viewed as a prescription concerning both an objective—"respect for technical competence"—and also the means by which that objective may be attained—"the personal handling of laboratory equipment and performance of experiments." Alternatively, the statement may be viewed as specifying "the handling of laboratory equipment..." as the objective. In this case, the implied assertion that this objective makes provision for the students to "gain a respect for technical competence" is part of the argument in defense of the objective.

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[1] Ontario Government, Department of Education, Curriculum Guidelines: Intermediate Division Science, Interim Revision (1972), p. 10.

The scheme in this study has been formulated as a means to analyze arguments for objectives rather than objectives and the methods of their attainment. The second interpretation, therefore, is the more appropriate one to use for the purposes of the study. Several of the passages, whose analysis is reported in chapter 4, are susceptible to similar alternative interpretations, and, in each case, the corresponding choice is made without further comment.

The objective—type C statement—is set out in the first two lines: "The students should handle laboratory equipment and perform experiments." Actually, the objective is phrased as a teacher objective, as the phrase "given every opportunity" indicates. It is the teacher who provides opportunities, not the students, but the intent is clear as far as the outcome is concerned. The desirable disposition which is intended to result from the achievement of the objective—the type A statement—is also clear in lines 3 and 4: "It is desirable that students have a respect for technical competence." Again a minor wording change seems justified. The original contains the word "gain" but inasmuch as the type A statement is a characterization of what the intended final state of the students will be, the substitution of the word "have" is legitimate.

The problem of inferences

The first two questions have been answered directly from the text, where the statements have been made explicitly. The third question requires that inferences be drawn concerning any propositional claims implicit in the statement cited. In this case, as in others that will be encountered in the larger portion of analysis in the next chapter, there is potentially a choice of several alternative propositional statements that could serve as the link between the type A statement and the type C statement, already identified. These are as follows:

B: Handling of laboratory equipment and performance of experiments will lead to a respect for technical competence.

B': Handling...can lead to a respect for technical competence.

B'': There are grounds for thinking that handling...can lead to a respect for technical competence.

It is necessary to decide on the format of statements of this type which are inferred rather than cited directly from the text. Such a decision is reached by considering the implications of each of the alternative statements for the logic of the argument as a whole. Statement B is a prediction, made with such certainty that one counter instance would render it worthless. Statement B' is a weaker version of statement B; it is less susceptible to empirical falsification, however. The third statement, B'', adds nothing substantive to statement B' as it concerns the central argument. It does, however, emphasize the importance of support for the statement. This third format will therefore be used when inferring such statements from the passage under analysis.

Sometimes the rationale for an objective is not stated simply in terms of a single "basic normative premise," but the argument is hierarchical in form. In these cases, the objective is argued for on the basis that it will (or can) contribute to the student's attaining a disposition which, in turn, can lead to another—and so on through several layers of argument. If this form of argument appears to be the case, then repeated application of the first part of the scheme is necessary, starting with the objective and continuing "upward" until the final layer is reached. Each layer of the argument requires one application of the first part of the scheme. Examples of this type of application are found in sections 3 and 4 of the detailed analysis in chapter 4.

Analyzing Prescriptive Arguments: Secondary Level

General Comments

The third question in the primary level of the analytical scheme attempts to elicit statements of a propositional nature—type B statements—and it is with these that this second level of analysis is concerned. Type B statements appear not only as relatively straightforward statements of fact, as in the previous example (where the nature of the support for them is clear), but also as statements which are themselves either the products of choice, even if only quasi-intuitive choice, or value positions, or even additional objectives. Frequently such statements are not presented as such but are written as matters of fact (as in the previous example). Consider the following, for example, found in a teaching guide from the Nova Scotia Department of Education:

"Science as practised by scientists involves,

(a) ways of unfolding the truth about the universe, and

(b) the organization of information that has been gathered."[1] The statement is made in the form of general support for an argument concerned with what should be taught as science in the elementary schools. It is therefore a type B statement, and is presented explicitly.

Although the statement is presented as a matter of fact, a partial claim about science, it can be clearly seen that, whatever the merits or demerits of the substance of the statement, it is not a matter of simple fact at all. There are numerous alternative statements about the nature of science, some of which, indeed, are quite incompatible with this one. It is therefore necessary to identify the choice that has been made and the implied value statement that identifies this statement and not one of the others as being the one chosen. Furthermore, a new type B statement is required that identifies the statement as one among several and not as a unique expression of truth. This further level of analysis will be referred to as the secondary level since it can take place only after the type B statements have been identified.

Another aspect of the further analysis of type B statements is the identification of any support provided for the statements made. Any propositional statement ought to be supportable either by empirical evidence or by reasoned argument. The absence of such support for an individual statement within the context of the larger argument does not, of course, invalidate the statement. However, the presence of some supporting argument or evidence is worth identifying, as it will be of use when the statements are further scrutinized in the course of deliberation.

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[1] Nova Scotia Government, Department of Education, Science in the Elementary School: A Tentative Teaching Guide, Education Office Bulletin No. 3, 1974-75.

Thus the secondary level of the analytical scheme may be formulated as two questions:

(1) WHAT VALUE POSITIONS, IF ANY, ARE IMPLIED IN THE PROPOSITIONAL STATEMENTS?

(2) WHAT SUPPORT, IF ANY, IS PROVIDED FOR THE PROPOSITIONAL STATEMENTS?

Sample Analysis

If the example introduced earlier (concerning the nature of science) is reexamined from the perspective of the first of these two questions, the following value position can be seen to be implicit in the statement: "The best (or most appropriate) way of thinking about science is as its involving a) ways of unfolding the truth about the universe, and b) the organization of information that has been gathered." Thus the result of a choice is made explicit and the values are exposed. In the analysis that follows in chapter 4, statements containing value positions, such as the one just made, will all be designated type A statements. Turning to the second question of the secondary analysis, it can be seen that, in this case, no support is provided for the claims about the nature of science. It must be emphasized again that this does not imply that the claims are unsupportable; it implies merely that they are not supported in the text being analyzed.

Thus, both the values and preferences are isolated and identified. As a result, teachers engaged in deliberation are in a position to discuss them as such and to appreciate the status of statements encountered. It will be shown in the following chapter that it is at this, secondary, level of analysis that many of the potentially controversial values are exposed. If the secondary analysis is not carried out, the reader is tempted to make a quasi-intuitive choice and accept the statement as a matter of fact, without recognizing the potential alternatives and the implied values that are sometimes present.

Summary

On the basis of Gauthier's analysis of practical reasoning, the requirements of an analytical scheme for examining prescriptive arguments in curriculum have been outlined. It has been shown that the Frankena model fulfills these requirements and provides the foundation for a scheme involving two levels of analysis and a total of five questions. An illustration of the procedure for an application of the scheme has been provided and the scheme is summarized below to aid the reader in following the discussion in the next chapter of four more extended pieces of curriculum argument.

The primary level of the scheme:

(1) WHAT OBJECTIVE IS SPECIFIED OR IMPLIED?

(2) WHAT BASIC NORMATIVE PREMISE(S) IS/ARE STATED OR IMPLIED?

(3) WHAT PROPOSITIONAL STATEMENT(S) IS/ARE MADE OR IMPLIED?

The secondary level of the scheme:

(1) WHAT VALUE POSITIONS, IF ANY, ARE PRESENT IN THE PROPOSITIONAL STATEMENTS?

(2) WHAT SUPPORT, IF ANY, IS PROVIDED FOR THE PROPOSITIONAL STATEMENTS?

CHAPTER 4

APPLICATION OF THE SCHEME: A CASE STUDY

A scheme of five questions has been developed for the analysis of arguments inherent in prescriptions of instructional objectives. The present chapter demonstrates the application of the scheme to generate the type of statements that have been shown to be necessary for a comparative appraisal of such arguments to be made. It must be remembered that the object of this demonstration is not to draw conclusions about the objectives or the arguments themselves, but to show that the scheme which has been developed is capable of use for analytical purposes.

Procedure

Portions of some curriculum guidelines in science, currently in use in the province of Ontario, have been reproduced verbatim in the Appendix (pages A1-A6). They have been selected on the basis of their potential to demonstrate the scope of the scheme, and the sections used correspond to complete sections of the original; each section relates to a single objective. The lines of the text are numbered within each section to facilitate references.

Each of the sections is discussed in detail below. Following the outline of the scheme, each analysis is presented in two parts, primary and secondary. The primary level of analysis considers each section as a whole and identifies the objective itself (type C statement) or the series of objectives, the basic normative premises (type A statements), and the supporting, propositional statements (type B statements). At this level, the statements produced by the analysis adhere as closely as possible to the language of the original. Changes are introduced only for the purpose of retaining the sense of the original and for grammatical purposes. In some cases, it is necessary to draw inferences, from the text, of premises which are not stated explicitly but which are necessary for the logic of the argument. Such inferences are clearly identified as such, and the language of the text is retained in stating them (with the qualification discussed in the previous chapter).[1]

At the secondary level of analysis, the type B statements identified in the primary analysis are examined more closely, as provided for in the second part of the scheme. Not every type B statement from each section is treated in equal depth; while this treatment would result in a large catalog of information, much of it would be redundant. Also, consistent with the purpose of the study, it is necessary only to demonstrate the use and applicability of the scheme rather than to comment exhaustively on the objectives themselves.

The reader is advised at this stage to read each section in the appendix before proceeding to the corresponding analysis, which appears below. Although the analysis of each section consists of finding answers to the questions of the scheme, specific reference to the questions themselves will be omitted in the interests of brevity.

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[1] Quotation marks are used to identify all statements of types A, B, and C, whether such statements are inferences, adaptations or direct quotations from the text.

Analysis of Section 1 (pages A2-A3)

Primary Level of Analysis

The objective for which this passage attempts to provide an argument is implied in lines 38-43. The intention of the authors appears to be, first, that students should understand scientists' models as a means to explain observations of the world, and second, that they should recognize them as being more effective (at explaining) than their own patterns or models. This, then, is the objective—the type C statement.

The type A statement—the basic normative premise—is even less explicit than the objective itself. It is closest to the surface in line 23, in lines 25-26, and in the quotation from Piaget (lines 30-33). A statement consistent with the sense of the passage and characterizing the objective as worthwhile might be this: "It is desirable that children be able to explain the universe around them by the best means possible."

The remaining statements serve as type B statements, that is, as propositional claims which relate the objective to the basic normative premise. Each is stated here in language closely related to the text; each is numbered for easy reference.

B1. "To a scientist, science has one main function: to impart order to a complex world" (lines 4-7).

B2. "Children, too, look for order. They develop patterns to explain the world. Older students revamp their patterns" (lines 23-27).

B3. "Teachers assist students in gaining an understanding of the scientists' model" (lines 34-37).

B4. "Scientists' models are more effective at explaining than are children's" (implied by lines 39-41).

B5. "Experience in the field, the laboratory, and the library is related to the revamping of patterns, by older children" (implied by lines 26-29).

B6. "An understanding of scientists' models puts a student in a position to discover that scientists' models explain his observations more effectively than he has been able to do" (lines 39-42).

The passage is replete with additional statements which could be listed here, but the six generated above are adequate for demonstration purposes. From the logical perspective, the premises stated here provide an adequate basis for considering the objective as a valid conclusion of the argument. Thus, the primary analysis is complete.

Secondary Level of Analysis

The secondary level of analysis involves scrutiny of the six type B statements identified from the primary level to determine the existence of additional value positions, and of support for the statements.

Analysis of statement B1: "To a scientist, science has one main function: to impart order to a complex world."

This statement has the form of a claim concerning what scientists think concerning the nature of science. It is given support by the words of Einstein cited at the opening (lines 1-4). The implication, embedded in the claim, is clear however: "Science has one main function: to impart order to a complex world." The question to be asked of this proposition is whether it represents a value position on the part of the authors (or, at least on the part of Einstein) or whether it is truly a statement of fact. Many statements concerning the function of science can be and indeed have been made. (One such was cited in an example in the previous chapter.) Some of these statements are at variance with this one, and therefore the use of this one represents the exercise of a preferential choice among several possible statements. Since a value position is involved, two statements may be substituted for the one. They are labelled B and A respectively with those letters having the same significance as before.

B1.1 "Science may be thought of as having one main function: to impart order to a complex world."

A1.1 "The statement B1.1 represents the most appropriate characterization of the function of science for the present context."

Analysis of statement B2: "Children, too, look for order. They develop patterns to explain the world. Older students revamp their patterns."

This statement is a claim concerning the way children behave. No direct evidence is provided, but Piaget's comment (lines 30-33) is presumably intended to lend indirect support. The same considerations apply here as obtained with B1 concerning the existence of a preferential choice among ways in which children's behavior may be described. Thus two statements are substituted.

B2.1 "Children may be regarded as 'searchers for order'."

A2.1 "This (B2.1) is an appropriate way to regard children."

In addition to these two statements, the word "too" (line 23) suggests a correspondence between children's searching for order and the activities of professional scientists. Thus an extra inference may be drawn concerning the comparability of these two activities.

B2.2 "There are grounds for considering children's search for order as being comparable to that of scientists."

This implied comparability lies at the heart of the argument in the passage. If no grounds can be found for such consideration, then the argument loses much of its force. The issue occurs again and with additional importance in the analysis of statement B4 (below).

Analysis of statement B3: "Teachers assist students in gaining an understanding of the scientists' model."

At first sight, statement B3 seems to be a claim about what teachers do. In the context of the development of a rationale for objectives, however, it appears more appropriate to regard it as a prescription regarding what the authors consider teachers ought to do. As such, it becomes another objective—a type C statement—which is therefore susceptible to the type of analysis which has already been carried out at the primary level. The analysis yields the following statements.

C3.1 "In the process of students' development, teachers should assist them to gain an understanding of the scientists' model."

A3.1 "The development of students is a desirable process."

B3.1 "There are grounds for thinking that an understanding of the scientists' model can assist students in their development."

Analysis of statement B4: "Scientists' models are more effective at explaining than are children's."

This statement may be analyzed in either of two ways. The consequences of this will be discussed when both have been detailed.

Analysis I: The statement appears to be a straightforward statement of value expressing the view that one model is superior to the other in terms of its effectiveness at explaining. Such a position does not necessarily imply a value judgement however—at least, not one which is beyond further scrutiny. Inasmuch as a comparative evaluation is being drawn between scientists' and children's attempts to provide explanations about the world, the statement B2.2 discussed earlier is applicable here also. B2.2 stated "There are grounds for considering children's search for order as being comparable to that of scientists." In this case it is the products of such searches that are being compared—the patterns or models—rather than the activities themselves, but the comparability statement may still be considered to apply. In addition, however, on this occasion more than qualitative comparability is being suggested. Here a relative judgement is being expressed concerning the efficacy of each search or of its product. Consequently, the following additional type B statements may be made which relate specifically to such a judgement.

B4.1 "Criteria exist whereby the relative effectiveness (at explaining) of different models may be evaluated." and

B4.2 "When judged on the existing criteria, the scientists' model is found to be more effective (at explaining) than are children's models."

Thus, the apparent value position B4 reduces to three matters of fact, rather than to any value position at all. However this is not the only way in which statement B4 may be analyzed.

Analysis II: In this second analysis, B2.2 still applies: it is still necessary to establish the basis of comparability. However, instead of a rational comparison on the basis of established criteria, the authors may indeed be expressing a personal preference for scientists' models over those of children, and may not be implying any reasoned evaluative judgement. The statement B4 is then properly replaced by a statement of the following type.

A4.1 "We prefer scientists' explanations." or

"This school system (or ministry) takes the position that scientists' models are superior to those of children."

The implications of such a view are profound, particularly if the issue of teaching versus indoctrination is at stake and if teachers follow through from this guideline by reproducing the same attitude in the classroom. Furthermore, since there is no provision in the text for determining which of the two analyses is the proper one, the danger exists that analysis II may pose as analysis I. That is to say, the authors may actually be taking a value stance, but suggesting to the readers that a rational statement of fact is being made. Discussion of the further implications of this situation is beyond the scope of the present study. Nevertheless, it is important that such alternative analyses be clearly identified, so that provision is made for the issue to arise in a deliberative setting.

Analysis of statement B5: "Experience in the field, the laboratory, and the library is related to the revamping of patterns, by older children."

The key to this statement is found in the original text, in the word "as" (line 27). It suggests a relationship—partly, at least, a cause-effect relationship—between experience in the field, the laboratory and the library on the one hand, and the revamping of older students' patterns on the other. It is possible to infer embedded propositions from such a claim, although on this occasion it might be unwarranted to do so. It may therefore remain a claim concerning the consequences of such experiences for older students, open to verification or refutation on the basis of the evidence. (Evidence is not provided in the passage.) The alternative is to reword the statements as claims concerning the potential consequences for older students, which might be argued for. Rewriting the argument is not the present task, however.

Analysis of statement B6: "An understanding of scientists' models puts a student in a position to discover that scientists' models explain his observations more effectively than he has been able to do."

This, too, is an empirical claim concerning the effects on students of their gaining an understanding of scientists' models. It contains the embedded statement B4 which has already been discussed at length ("Scientists' models are more effective at explaining than are children's."). It might be noted in passing that on this occasion the authors take care not to claim that an understanding of scientists' models will result in the discovery (of their superiority), but only that it results in the students being in a position to make the discovery. The problems of such a claim have been discussed at length in chapter 3, but, as with statement B5, B6 does not appear to contain any embedded value position and therefore may be left as a propositional statement.

Analysis of Section 2 (page A4)

Primary Level of Analysis

The structure of the argument here, which attempts to provide a general rationale for the inclusion of science in the school curriculum, is set out quite clearly. The analysis is included to provide a contrast with section 1, in that this section is analyzable very simply into three major statements. The objective of the program is enunciated in lines 14-24 where it is implied that students should develop skills in basic processes (four are listed) and aptitudes for intellectual activities (six examples are given). Thus the type C statement is as follows.

"Students should, through science studies, develop skills such as observation, classification...and aptitudes such as inferring, formulating hypotheses...."

The development of skills and aptitudes, along with the development of personality and character, has been described earlier (lines 9-13) as being desirable. Thus the type A statement is simply this.

"It is desirable that students develop their skills aptitudes...."

The important issue in this passage stems from the type B statement which is not stated explicitly but on which the thrust of the argument depends. This links the other two statements, serving as a connection between science studies and the development of skills and aptitudes. A statement of it might be the following.

"There are grounds for thinking that science studies can provide for the development of the skills and aptitudes listed."

Secondary Level of Analysis

In this case, the type B statement presumes the existence of reasons for thinking in the way indicated. Thus the answer to both questions is negative, and the analysis of this section is therefore concluded.

Analysis of Section 3 (page A5)

Primary Level of Analysis

This section (and the next) illustrates a style of analysis quite different from the two sections already analyzed. Instead of a single objective and a single basic normative premise, the passage is regarded as a hierarchy of objectives and normative premises stacked, one on top of the other, in such a way that the normative premise in one argument must be treated as the objective for the next. There are, of course, type B premises which serve as links between one "layer" of the argument and the next. In the case of this section, furthermore, the literary style of the passage tends to obscure the logical threads of the argument. Thus a fair amount of unravelling of these threads must first be carried out. This is part of the task in the primary level of the analysis.

The passage may be broken down into four inter-locking parts: a preliminary statement (lines 1-5), part 1 of the argument (lines 5-11), part 2 (lines 12-17), and, finally, part 3 (lines 18-24). There are three layers to the hierarchy, and the analysis proceeds, consistent with the order of the questions in the scheme, from the objective to the basic normative premise.

The lowest layer of the argument is contained in part 3; it comprises the following objective and basic normative premise.

C1. "Students should be given opportunities to plan the procedures in an investigation and study the effects of different variables" (lines 18-21).

A1. "It is desirable that students share responsibility for the determination of their own curriculum" (lines 16-17 and 22-23).

The type B statements, of which there are many, provide (among other things) the links between layers of the argument. They are therefore not treated here but are grouped together at the end of this part of the analysis.

In the second layer of the argument, found in part 2 (lines 12-17), the objective is derived from the basic normative premise of the previous part—statement A1—and the basic normative premise of this part may be stated as follows.

A2. "It is desirable that students be prepared to take the responsibility for the future shaping and moulding of their communities" (lines 16, 15, & 13).

The third layer of the argument moves from part 2 into the preliminary statement. The objective, as before, is derived from the basic normative premise of the previous section, in this case A2. The overall disposition to which such an objective is intended to contribute may be stated as follows.

A3. "It is desirable that students should share in building a brave new world" (lines 3-4).

To complicate matters still further, there is a second thread to the argument, having a layer of its own. This is found in part 1 and in the remaining portion of the preliminary statement. In this thread, the concern is with the students' finding their own place in the world and with the provisions made for this to be achieved. The objective in this thread is the following.

C2. "The student should become aware that he is both a natural part of the natural world and a conforming or non-conforming part of his technological environment" (lines 5-10).

The basic normative premise is this.

A4. "It is desirable that young people come to find their place in the world" (lines 1-2).

The relations among the various statements, parts of the passage, layers of the arguments, and the two threads are illustrated in Figure 2. In the figure, the parts of the passage are separated by horizontal lines and the threads of the argument by a vertical line. The arrows represent layers of the argument, the lowest being at the bottom of the diagram. The statements are identified in the usual way.

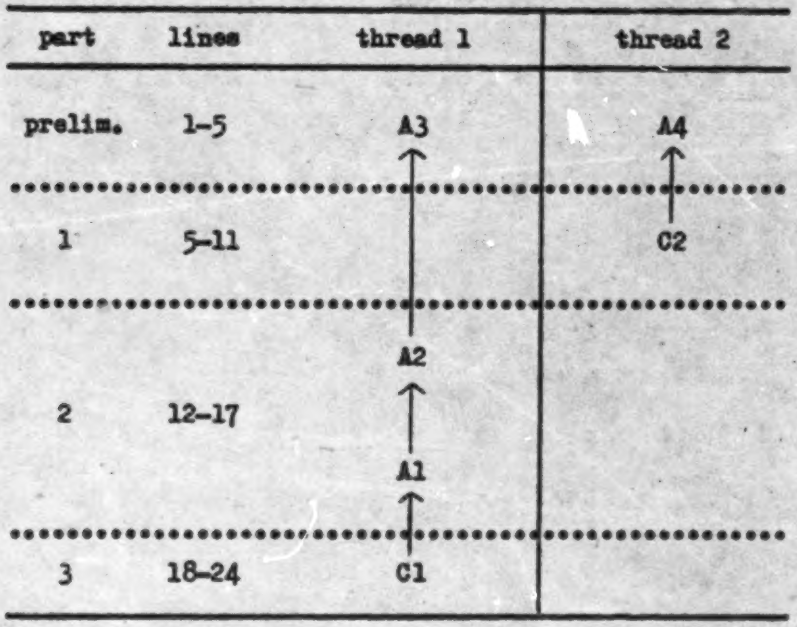

Figure 2

There are a large number of type B statements either explicit or embedded in the passage. A selection, only, will be discussed in this analysis. The numbering of those that follow is purely for reference purposes and is not connected with the numbering of the type A or type C statements in the preceding section.

B1. "The student is both a natural part of the natural world and a conforming or non-conforming part of his technological environment" (lines 7-10).

B2. "Ecology and man, technology and man, are inseparable" (lines 10-11).

B3. "A student does alter his world" (line 12).

B4. "A student's actions mould and shape his community" (line 13).

B5. "A student is responsible in the present and will be responsible for the future" (lines 14-15).

B6. "There are grounds for thinking that each of the following propositions is the case: that a) planning procedures in investigations and the study of the effects of different variables can contribute to a student's experience, and that b) this experience is a significant aspect of the determination of his own curriculum, and that c) participation in such determination can prepare the student for the future shaping and moulding of his community, and that d) such shaping and moulding forms a meaningful component of building a brave new world; also that e) science studies can assist a student to find his place in the world" (implied by the entire passage). Thus, the rather involved primary level of analysis on this section is completed, and further scrutiny of the type B statements may now take place.

Secondary Level of Analysis

By contrast with the primary level, the secondary level of analysis is a relatively simpler task. To expedite the analysis, the type B statements are grouped together in three clusters.

Analysis of statements B1 and B2: "The student is both a natural part of the natural world and a conforming or non-conforming part of his technological environment." "Ecology and man, technology and man, are inseparable."

These are similar claims, the first being clearly a tautology and the second being an assertion concerning the inseparability of man, ecology and technology. This assertion, although not explicitly argued for, may be interpreted in either of two ways. It may be taken as a defensible claim for which the argument is not actually stated, but which has been thought out. Alternatively, it falls into the category of a value stance where the statement is being asserted as the position of the authors. As with the previous example of alternative analyses (section 1, statement B4), there is no provision made in the text for preferring one analysis over the other and therefore both must be left as possibilities for discussion.

Analysis of statements B3, B4, and B5: "A student does alter his world." "A student's actions mould and shape his community." "A student is responsible in the present and will be responsible for the future."

These three statements are grouped together; although they all take the form of matters of fact, they may also be interpreted in the context of this passage as statements of what should be the case. The authors could be making two different types of claim in each of the statements listed here. Interpreted as empirical claims, they are stating that students do, in fact, alter their world, that their actions do mould and shape the community, and that they are and will be responsible. Or, as indicated by an earlier example, it could be that the authors are making type A statements concerning what they consider to be desirable states of affairs. Again, there is no ground for expressing a preference for any one of these, and so, all three must be open to examination.

Analysis of statement B6: "There are grounds for thinking that each of the...propositions is the case" (see p. 46).

This statement is another example of that type of claim concerning the provisions made by the attainment of one objective for the reaching of a further goal. The language used in phrasing statement B6 was discussed in the example given in chapter 3, and in this case, the only difference is the presence of an explicit hierarchy of objectives and therefore of type B statements linking them. It should be noted that the statements B6 (a) through (d) refer to the first thread of the argument while B6 (e) refers to the second thread. In the sequence (a) through (d), the showing of any one of the claims to be false would have the result of breaking the thread of the argument at that point.

Analysis of Section 4 (page A6)

Primary Level of Analysis

This section, as was the case with section 3, is hierarchical in construction. There are here, however, six layers to the argument instead of three, but only one continuous thread instead of two, which makes for somewhat easier unravelling. The passage attempts to provide a rationale for the learning (by students) of the facts and principles of science on the grounds that it leads to "scientific literacy," an important component (they claim) of education, and thus necessary for the survival of man and of society. As before, the analysis proceeds from the lower layers of the argument toward the higher layers and first identifies the objective and basic normative premise found in each layer, before moving on to consider the supporting premises.

The lowest layer of the argument yields the following objective and basic normative premise.

C1. "Students should know some of the important facts of science and understand some of the fundamental principles" (lines 8-9 and 12-13).

A1. "It is desirable that students be able to see the application of scientific principles" (lines 20-21).

Statement A1 then becomes the objective of layer two of the argument, whose basic normative premise is as follows.

A2. "It is desirable that students appreciate the significance of scientific principles" (lines 22-23).

This statement provides the objective of layer three whose type A statement is this.

A3. "It is desirable that students become scientifically literate" (lines 23-24 and 4-8).

The objective of scientific literacy is seen, in the fourth layer of the argument, as being necessary to attaining the next normative premise.

A4. "It is desirable that students become literate" (lines 3-4).

This, too, is seen as a component of education in general which in turn is claimed to be "needed for survival." Thus the two remaining premises may be stated in the following manner.

A5. "Education is a desirable thing" or "it is good to be educated" or "it is desirable that we have an educated society" (implied by lines 1-4).

A6. "Survival is important" (line 1).

It may appear somewhat absurd to go to this length to justify the objective stated at the outset. The task of this analysis is, however, to reproduce as faithfully as possible all components of the argument as they are found in the text, and not to pass judgements on them by performing that type of selection which the criticism implies should be carried out. At a subsequent discussion which is concerned with the defensibility of the objectives, such a criticism might have a place. However it is at the highest layer of normative premise that the most significant value positions, having an impact on the entire curriculum, can be expected to emerge.

It is to be expected that with six layers of argument a large number of type B statements are necessary to link the levels together, and to provide additional support for the conclusion. In this case, six have been selected for comment.

B1. "Education _is_ desperately needed for survival, both for the individual and for society" (lines 1-2).

B2. "A component of education is literacy" (implied by lines 3-4).

B3. "Literacy means more than reading and writing; it includes scientific literacy" (lines 3-6).

B4. "Literacy includes some knowledge of the great ideas of science" (lines 4-6).

B5. "Man sees patterns in the universe" (implied by line 7).

B6. "An understanding of the principles of science and their application can result in an appreciation of their significance which in turn is necessary for the attainment of scientific literacy" (lines 20-24).

This last statement could be continued to cover all the layers of the argument, but the several layers covered here serve as an adequate illustration.

Secondary Level of Analysis

As with the previous sections each of the six statements may now be examined in more detail, so that additional value positions that are implicit in them may be extracted.

Analysis of statement B1: "Education is desperately needed for survival, both for the individual and for society."

This statement concerns the function of education. It suggests that the function of education (or one function at least) is to ensure the survival of man and of society. Many such statements have been suggested as what the function of education is in fact or what it should be ideally. It is difficult to determine which type of statement this is. If it is the former, then it represents one of several such descriptive statements about the function of education. A preference is being expressed for this particular one and therefore two further statements may properly be substituted.

B1.1 "One of the functions of education is that of survival."

A1.1 "B1.1 represents the most important or relevant function."

If, however, the second type of statement is the one being used, then the value position is clear, although the phrasing in the original is far from being so.

Analysis of statement B2: "A component of education is literacy."

This is a straightforward claim, for which there is no argument expressed but which, one must assume, rests on adequate reasoning. The alternative explanation is, as with statement B4 of section 1, that the authors are simply asserting this as a matter of policy or of personal preference. Further data would be required to resolve this issue.

Analysis of statement B3: "Literacy means more than reading and writing; it includes scientific literacy."

This statement involves an assertion concerning the meaning of a word. It is a definition stipulated by the authors and, as such, the statement is a statement of value—that is, that literacy should be regarded as including scientific literacy.

Analysis of statement B4: "Literacy includes some knowledge of the great ideas of science."

B4 is an extension of B3, in that the component of literacy referred to in B3 as "scientific literacy" is here further specified as involving "knowledge of the great ideas of science." The term "scientific literacy" has a sufficiently broad and indeterminate usage that it would appear the authors are free to give it any meaning they wish. The meaning of the term is of little interest to anyone unless it is implied that his conduct should in some way be influenced by it. In the context of curriculum guidelines, that is clearly the intention and therefore the types of disposition or activity that are specified as scientific literacy become significant. If it is agreed that the term "scientific literacy" has no commonly accepted meaning, then the selection of dispositions becomes a matter of value—governed choice, and this must be assumed to be the case here. Thus the statement becomes the following.

A4.1 "It is our position that scientific literacy should include some knowledge of the great ideas of science."

Analysis of statement B5: "Man sees patterns in the universe."

This statement, which is implied by line 7 of the passage, is another which leaves itself open to a variety of interpretations. The subject of the nature of science, of patterns and models, was discussed at some length in the secondary level of the analysis of section 1 and will not be repeated here. Taken literally, the statement refers to the seeing (with eyes) of patterns in the universe. That is a possible meaning here if, for example, one is concerned with astronomy or with crystallography. It seems more likely, however, that the authors are referring to a less restricted view of the meaning and that a metaphorical use of the word "sees" is intended. If this is the case, the attention of the reader is drawn to the word "in." Is the sentence intended to mean that the patterns are there in the universe and that man as an objective observer is seeing them? Whatever one's belief concerning the most appropriate view of the nature of science, this is one legitimate interpretation of the statement B5. Taken even more figuratively, the sentence could also be regarded otherwise as including the notion of man imposing his own perspectives on the universe and discovering "patterns" in his results. Further discussion of this point is out of place here, but it is important to note the wide range of interpretations possible from a brief and embedded reference.

Analysis of statement B6: "An understanding of the principles of science and their application can result in an appreciation of their significance which in turn is necessary for the attainment of scientific literacy."

Discussion of statements of this type has taken place on several other occasions (e.g. statement B6 in section 1 and in section 3), and no further comment is necessary at this point.

Summary

The object of this analysis has been to reveal the premises and conclusions of prescriptive arguments found in the selected passages. The results of each section of analysis can be seen to consist of an objective or series of objectives, one or more premises embodying value positions, and one or more propositional statements. Such premises and statements, as noted earlier, are desirable prerequisites to deliberative discussion where teachers or others are considering alternative prescriptions.

CHAPTER 5

CONCLUSIONS

The aim of this study has been the construction of an analytical scheme capable of probing prescriptive curriculum arguments for the purpose of exposing the bases of such arguments.

Discussion of curriculum as a practical enterprise, where teachers are concerned for what they ought to teach, led to an examination of the characteristics of practical reasoning, as outlined by Gauthier. Further to this, the consideration of curriculum arguments as practical advice to teachers made necessary an examination of the ways in which pieces of such advice may be criticized and compared. Discussion of these two key areas revealed that any prescriptive argument contains premises of two types, both of which may be mistaken. The first and major premise embodies a value position—it characterises some state as being worthwhile or desirable—while the second or minor premise is a statement of fact involving attributes of the situation or the "context of activity."

It was thus shown that an adequate analytical scheme would expose these premises in such a way that deliberation about them would be facilitated. A model with potential for achieving this end was identified and this model was adapted to provide a scheme in two levels involving a set of five questions to be asked of an argument being analyzed.

Four portions of a set of current curriculum guidelines for Ontario were then selected as having potential for a demonstration of the application of the scheme, and the analyses were carried out. The products of the analyses were, in each case, two sets of statements which corresponded to the two types of premise described earlier. It was anticipated that such statements could form part of the data-base for a comparative appraisal of several alternative guidelines, prior to a deliberated decision concerning a defensible course of action.

The study now concludes with some reflections on the use of the scheme together with suggestions for further research both on the scheme itself and on its application.

Reflections on the Application of the Scheme

During the application of the scheme, detailed in chapter 4, certain problem areas were encountered. Three are worthy of comment at this point.

The first involves the degree to which it was found that the analyst's personal judgement was required in drawing inferences from the text. Some instances of this are a result of the logical requirements for a completed argument; for example, the generation of a type A statement in section 1 is a necessary component of the analysis. The wording of such an inferred statement, however, involves the judicious choice of words on the part of the analyst. On such occasions, relatively small variations in wording can have a profound impact on the meaning and the status of the resulting statement. The example of a secondary analysis in chapter 3 provides a good illustration of this point.

There are other situations, notably in inferring the presence of type B statements, where the analyst's judgement plays a major role in determining whether or not to draw such inferences. The primary analysis of section 1 (yielding statement B5) and the secondary analysis of the same statement provide examples of where that judgement was exercised for and against, respectively, the drawing of inferences.

Such an exercise of judgement, even if used with caution, leaves the analyst open to the criticism that his own values have been imposed on the results of the analysis. This criticism must be acknowledged, but two points in relation to it are in order. First, it could be argued that a valid analysis could not be carried out without the use of judgement in the drawing of inferences, as any statement of rationale is likely to contain embedded value positions; to be effective, the analysis must be capable of identifying these. Second, and more importantly, any claim of an analyst for complete objectivity is probably suspect. The very design as well as the application of the scheme must contain some embedded value positions of the designer-user, and an honest investigator will acknowledge these. The test of his analysis is not in the impact of his own values, however, but in the quality of his arguments both in the design of the scheme and in its use.

The second problem area associated with the use of the scheme concerned the design of the scheme itself. On trial use, the scheme was found to be inadequate in at least two respects. The earliest draft of the scheme was unable to take hierarchical arguments into account, such as were encountered in sections 3 and 4. In addition, the original form of the secondary part of the scheme envisaged only a single kind of type B statement to be dealt with. The detailed analysis revealed at least three different kinds of type B statement. Thus the application of the scheme became reflexive. The scheme underwent modification and refinement as the application was carried out, until it reached its final form, documented in chapter 3. Far from indicating a fundamental weakness, this reflexive development showed that the scheme was indeed "in touch" with the data, and that fresh data required its further refinement. The point at which this process was concluded is, to a certain degree, arbitrary, but it is also an indication that further application did not require further extensive revision. This is not to claim that a perfect scheme has now emerged, but simply that the scheme as documented here was found to be adequate for the analysis that was carried out. Suggestions for further improvement and research are made later in this chapter.

The final problem area, which is left unresolved, concerns the existence of alternative analyses of the same section or part of a section. A good example of this is found and discussed in the secondary analysis of section 1, statement B4. Here two analyses were suggested and no means existed which provided a basis for resolving the conflict. The scheme was incapable of determining the issue, of course, and—as was indicated—the data made no such provision. It was important, at this point, that the analyst not make a personal choice between the alternatives, as this would have represented a gross intrusion of his personal values on the use of the scheme. Consequently, the question was left open. The only way in which the problem might be resolved would be through personal communication with the authors of the passage under analysis. This latter was not done, since resolution of the issue was of no consequence for testing the scheme.

Implications of the Study for Further Research

The intent of the present study was to conceptualize a complex problem and to translate the conceptualization into a workable analytical scheme. At least three further studies would seem to be required before it could be claimed that the scheme was useful on a broader basis. Its adequacy to deal with a wider range of prescriptive arguments would have to be tested by using a random selection of arguments as the data for analysis. Secondly, its ability to generate consistent results from different users would require the analysis of the same argument by several independent persons and the use of a measure of the consistency of their judgements. Finally, a case study, monitoring the deliberations of a curriculum committee, could provide empirical evidence for the claim that the analysis of arguments in the manner described in this study did, in practice, have the intended effect of facilitating deliberation toward a defensible choice.

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APPENDIX

Reproduced from: Ontario Government, Department of Education, Curriculum Guidelines: Intermediate Division Science, Interim Revision (1972), pp. 5, 8-10.

Headings from the text have been retained. Section and line numbers have been added for the purposes of the study.

SECTION 1

The Search for Order

Einstein has defined science as "the attempt to make the chaotic diversity of our sense experience correspond to a logically uniform system of thought."[1] Thus to a scientist, science has one main function: to impart order to a complex world that appears at first sight to be in confusion. He seeks to develop patterns, sometimes called models, and he looks for relationships so that the universe, or at least some segments of it, may become predictable. Then, in whatever way seems suitable, he describes the universe around him. Of course there will be difficulties; problems will arise. A scientist, however, has long experi[illegible] he is skillful, he has learned techniques, he has colleagues, he has literature resources in his discipline, and hence may be able to resolve his problems to some extent. Decade by decade, the scientist comes closer to being able to see his universe as a logically ordered system.

Children, too, look for order. Students do not have a repertoire of models to call on. Bit by bit they develop patterns to explain the real world around them. Older students revamp their patterns as they gain more experience in the field, in the laboratory, and in the library. Jean Piaget expresses the process: "Each new level of development is a new coherence, a new structuring of elements which until that time have not been systematically related to each other."[2]

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[1] John H. Woodburn and E. S. Obourn, *Teaching the Pursuit of Science* (New York: Macmillan Co.; Toronto: Collier-Macmillan Canada Ltd., 1965), p. 9.

[2] Eleanor Duckworth, "Piaget Rediscovered", *Journal of Research in Science Teaching*, vol. 2, no. 3 (1964). Reprinted in *Readings in Science Education for the Elementary School*, eds. E. Victor and M.S. Lerner (New York: Macmillan Co.; Toronto: Collier-Macmillan Canada Ltd., 1967), p. 317.

In this process of development, the teacher assists the student in gaining an understanding of the model developed by scientists to explain the phenomena being studied. The student is then in a position to discover that the scientists' model explains the observations he has made himself and explains them more effectively than he has been able to do.

SECTION 2

Science as a Vehicle for Education

One function of the study of science in the school—the development by students of patterns to explain the world around them—has already been described. In the teacher's mind, however, a principal function of science studies is to serve as an educational tool; it is in this respect that all subjects in the school curriculum serve a common goal. The development of character and personality, of attitudes and skills, of aptitudes and interests is a fundamental goal that transcends in importance the learning of specific subject content.

Science also shares with other subjects opportunities to provide for the development of skills in such basic processes as observing, classifying, measuring and using space-time relationships. In addition, science studies also assist the student to develop his aptitude to infer, to formulate hypotheses, to design experimental situations to test these hypotheses, to recognize variables, to assess data critically and to reason both inductively and deductively.

In both of these areas—the development of personal characteristics and skills of learning and investigation—science serves as [illegible] valuable vehicle for the fundamental aims of education.

SECTION 3

Responsibility

Young people today are looking to find their place in the world as it is, and yet they expect to have a share in building a brave new world. The science program can include both. The student of the intermediate years should be intensely aware that he is both a natural part of the natural world and a conforming or non-conforming part of his technological environment. Ecology and man, technology and man, are inseparable.

A student does alter his world, however; his actions mould and shape his community. He is responsible in the present and will be responsible for the future. How better can he prepare than by having some share in determining his curriculum?

. . . .

Are students given adequate opportunities to plan the procedures in an investigation themselves, to divide the study of the effects of different variables among themselves, so that they gain experience through assuming responsibility and encountering difficulties when responsibilities are not fulfilled?

SECTION 4

Literacy

Education is desperately needed for survival, both for the individual and for society. To be literate in these days means more than being able to read and write. Today it would include having some knowledge of the great ideas of science, some understanding of the patterns that man sees in the universe. There are many principles that responsible adults should understand: for example, the principle of the conservation of energy and matter.

Likewise, there are many simple reference facts that can hardly be missed in today's culture: man breathes out more carbon dioxide than he breathes in, table salt contains two elements, rockets operate best outside the atmosphere, electro-magnetic radiation moves at 300,000 kilometers per second.

. . . .

Are the principles studied being applied to a variety of phenomena so that the student may gain an appreciation of their significance and hence attain a useful scientific literacy?